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ABSTRACT

Nine industry-based adult literacy programs across the country were studied to identify exemplary training programs and practices that business and industry trainers, planners, and policymakers and individuals in the public education sector alike could replicate in designing adult literacy programs. Training programs offered by the following organizations were among those studied: Onan Corporation, Minneapolis, Minnesota; Philadelphia Hospital and Health Care District 1199C; Planters Peanut Company, Suffolk, Virginia; Polaroid Corporation, Cambridge, Massachusetts; R.J. Reynolds Tobacco Company, Winston-Salem, North Carolina; Rockwell International, Denver, Colorado; and Texas Instruments, Inc., Austin, Texas. The programs studied could be classified as either (1) traditional programs that were viewed primarily as employee benefits or (2) instruments for achieving the company's advanced technology goals. Traditional programs were generally initiated during an era of company prosperity and security, whereas the "new" literacy skills programs were initiated during an era of foreign competition and rapid technological change. Reading and mathematics were the most frequent skills taught in the programs studied. In general, initial union resistance and supervisor indifference to the programs appeared to give way as the programs' benefits became apparent. Most of the programs examined offered on-site training, although several of the programs were collaborative ventures between the company and/or union and local educational institutions. (This report includes case studies of seven of the nine programs studied, a synthesis and a summary of the study findings, and a list of recommendations to help training planners and instructors meet employee's needs for literacy training. Each case study includes information on the program's history, basic skills requirements, structure, employee participation, instructional processes, and evaluation procedures and outcomes.) (MN)

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Adult Literacy

Industry-Based Training Programs

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Research and Development Series No. 265C

ADULT LITERACY:
INDUSTRY-BASED TRAINING PROGRAMS

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FOREWORD

More and more American companies are beginning to offer remedial literacy training—instruction in reading, math, verbal and written communication, and other basic skills—to their employees. The need arises from many factors, including the pressures of foreign competition, the adoption of advanced technology equipment and processes, the expansion of job tasks that require higher levels of worker competence, and the cost-effectiveness of retraining existing workers instead of laying those workers off and hiring new employees to replace them.

As companies, unions, and entire industries contemplate these literacy training needs, they look for information and insight into effective ways to plan, deliver, and improve such training efforts. This report examines how each of seven industry-based literacy training programs approaches its company's need to boost the basic skills of its workers. It is a companion to the report, *Adult Literacy: Skills for theAmerican Work Force* (Hull and Sechler 1987); both were developed from an original report, *Industrial Literacy Programs: Final Project Report* (Hull, Fields, and Sechler 1986). The findings should be helpful to business and industry planners and policymakers, training managers, trainers, interested union officials, employees involved in participatory management, and administrators and instructors in the public education sector who contemplate a collaborative role with industry in delivering literacy training for employees.

Visits were made to nine different industry-based literacy programs across the country. Only seven programs are acknowledged in this report, however, because clearance to use names had not been received from two sites at the time the manuscript went to press. The authors talked with company executives, training managers, union officials, education providers, production supervisors, and numerous employees who were enrolled in the programs. While space does not permit us to thank each one individually, we are grateful to each of them.

Special thanks are due the various training managers who cooperated in hosting the site visits and making sure we had easy access to people and information. They include Susan Peterson, Onan Corporation; James T. Ryan, Philadelphia Hospital and Health Care District 1199C Training and Upgrading Fund; Sue M. Jones, Planters Peanuts Division of Nabisco Brands, Inc.; Linda Stoker, Polaroid Corporation; Dr. Velma Jackson, Forsyth Technical College, for R. J. Reynolds Tobacco Company; Harriet Mulvaney, Rockwell International; and George Matott, Texas Instruments, Inc.

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The original project staff included Dr. William L. Hull, Senior Research Specialist, Dr. Ernest L. Fields, Research Specialist, and Judith A. Sechler, Program Associate, all of the National Center. Development of this report was directed by Dr. Fields with assistance from Dr. Hull and Ms. Sechler. Clerical support was provided by Beverly Haynes, Jeanne Thomas, and Rita Charlton. Editorial assistance was provided by Judy Balogh, Jeanne Desy, Ruth Morley, and Margaret Honton of the Editorial Services staff, and special editorial help was provided by Constance K. Faddis, Program Assistant, all of the National Center.

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The National Center for Research
in Vocational Education

EXECUTIVE SUMMARY

The American population is becoming increasingly aware of the extent of adult illiteracy and its impact on private industry. Recent estimates set the number of functionally and marginally illiterate adults at approximately 60 million, one-third of the adult population in the United States. The levels of adult illiteracy were long obscured by (1) adequate employment for adults with no or low literacy skills, (2) simpler definitions of literacy and faulty survey methods, and (3) a stigma that keeps people from admitting illiteracy or seeking help.

The growing awareness of the extent of illiteracy is being fueled by (1) increasing technological advances and foreign competition, which are driving up basic skill requirements for functioning in industry; (2) broader definitions of illiteracy that take into account related skills such as speaking, listening, and basic mathematics required to function in the workplace; and (3) the discovery that many more people are functionally illiterate than those who fit our former stereotyped notions.

At the same time industry requirements for basic skills are increasing, the number of eligible new entrants to the work force is being reduced by the number of both high school dropouts and graduates who are functionally illiterate. Moreover, if left unchecked, the proportion of functionally illiterate persons at entry-level age will increase with projected declines in the overall young adult population from now to the end of the century.

As functional illiteracy takes its toll on private industry in lost productivity, wasted material, damaged machinery and hazard to employees, many companies are finding it imperative to provide remedial education, often in cooperation with the schools, to both new entrants and long-term employees. For the latter group, particularly, remediation is more cost-effective than the termination of good but "topped-out" workers and the hiring of replacements.

The National Center's research project investigated such industry-based literacy training programs to (1) identify and study existing industry-based adult literacy programs, (2) identify trends in practices and approaches of industry-based programs, and (3) review and classify adult literacy skills currently needed in the private sector. This report focuses on the first two objectives; the third objective, which deals with adult literacy skill classification, is covered in a companion report, *Adult Literacy: Skills for the American Work Force* (Hull and Sechler 1987).

Project staff visited nine industry-based program sites and interviewed company officials, plant managers, union officials, literacy instructors, and employees who were enrolled in the classes. Information on the training models was collected in the following areas of interest: history of the company or union and its training program, basic skill needs for job entry and advancement, literacy program structure, employee participation patterns, instructional content and processes, and program evaluation processes.

The companies and union whose training programs were examined included the following:

- Onan Corporation, Minneapolis, MN
- Polaroid Corporation, Cambridge, MA

- Philadelphia Hospital and Health Care District 1199C, Philadelphia, PA
- Planters Peanuts Division of Nabisco Brands, Inc., Suffolk, VA
- R.J. Reynolds Tobacco Company, Winston-Salem, NC
- Rockwell International Corporation, Denver, CO
- Texas Instruments, Inc., Austin, TX

The seven case studies reveal a number of general patterns in the establishment and operation of industry-based literacy programs. Following is a summary of major features:

- Industry-based literacy program approaches can be divided into two groups: (1) pre-1980, viewed primarily as traditional benefits for the employee; and (2) post-1980, viewed primarily as instruments for achieving the company's advanced technology goals.
- Traditional programs were generally initiated in an era of company prosperity and security; new literacy skills programs were initiated during an era of foreign competition and rapid technological change.
- In some cases, new basic skills programs were initiated after it was discovered that employees lacked the basic skills with which to acquire more technical skills.
- The production system that most low-skilled workers entered was highly segmented and routinized, designed to accommodate large numbers of employees who had no or low basic skills.
- Advanced technology and worker-centered control processes are increasing the ratio of high- to low-skilled jobs available.
- High school diplomas or their equivalents are rapidly becoming the new standard entry-level requirement for industry.
- Reading and math were the two basic skills taught most often in the industry-based literacy programs.
- Employee participation in literacy programs was voluntary, but persons in need of training were less likely to be considered for promotion and more likely to be laid off during employee reduction.
- In nearly every literacy program, enrollment increased after the initial cycle when employees saw the benefits; in some cases, clerical workers and supervisors enrolled.
- Industry-based skills programs are adding a third responsibility to the traditional human resource development responsibilities (those of management training and technical training).
- Initial union resistance or supervisor indifference gave way to literacy program support after the benefits in improved worker performance became apparent.
- Literacy programs were solely company or union operated or they were collaborative efforts between the company or union and public secondary schools, community colleges, or technical schools.
- Literacy instructors were provided from within the company or recruited from outside, depending on skill training needs, staff capabilities and flexibility of area educational institutions.

- Program evaluation tended to be informal and based on feedback from instructor, employee, and supervisor.
- Most industry-based literacy training occurs on the company site, partly for employee convenience, and partly because many employees find schoolroom environments inhibiting.

As more and more companies adopt state-of-the-art technologies, job tasks are becoming increasingly sophisticated and job functions are becoming enlarged and less narrowly defined, requiring better basic skills of workers. As a result, the incidence of industry-based literacy programs is likely to increase. Plant managers will have no choice but to upgrade the basic and technical skills of their work force.

Small companies will need to enlist the help of outside educational agencies to provide these training services. Already, community colleges and technical institutes provide many of the basic skills courses and customized training courses needed by these companies. Company executives, training department managers and instructors, and the public education community as a whole will need to learn more about the factors that make industry-based literacy programs successful. Some recommendations to help training planners and instructors meet these expanding needs are the following:

1. The definition of literacy for the workplace should be expanded to include science and reasoning as pretechnical skills necessary for workers in high-tech industries.

2. Analyses of tasks to be performed on the job should be used as a basis for developing higher-order literacy skills among employees.

3. Companies should establish a secure atmosphere in which employees can assess and raise skill levels.

4. Whenever possible, companies should try to upgrade the skills of existing workers for new tasks rather than hire new workers and lay off existing workers.

5. Training managers need to develop clearer ways of showing return on investment in basic skills programs in order to enhance internal marketing of programs.

6. Collaboration should be maximized between industry and educational service providers whenever this provides high-quality instruction in a cost-effective manner.

7. Programs should be developed to update the skills of literacy teachers who are to be instructors in business and industry.

CHAPTER 1

INTRODUCTION

Only during the past few years has the American public begun to be aware of the level of adult illiteracy in the United States. Perhaps less appreciated is the threat of illiteracy to the economic future of the nation. Estimates of the number of illiterate adults in this country have grown from 57 million illiterate or marginally literate Americans in the 1970s (Northcutt et. al. 1975) to as many as 84 million in 1985. And although estimates have been adjusted, there was some consensus among leading researchers in 1984 that combined figures for functional illiteracy and marginal literacy of adults amounted to about 60 million—more than one-third of the U.S. adult population of 174 million (Kozol 1985).

The recent revelations concerning the extent of adult illiteracy lead one to question how the problem was obscured for so long. Several factors may be cited. First, until recently, the availability of unskilled jobs in private industry provided secure employment for illiterate adults. Second, as Kozol (1985) explains, the U.S. census survey methods—which based figures on responses to printed questionnaires about grade completion levels, and on self-reported responses in a small sample of telephone and home interviews—provided erroneous information. As late as 1980, the U.S. Census Bureau boasted a national literacy rate of 99.4 percent. Third, the widely held "deficit" view of adult illiteracy, which places blame on illiterate adults (see Fingeret 1984), discourages their seeking help.

A number of factors are at work to infuse new reality into our thinking about adult illiteracy. First, the literacy requirements to function in private industry are changing. For the first two decades following World War II, Noyelle (1984) notes that firms of all types—large, small, manufacturing, and service—relied on internal career ladders rather than formal education for employee entry and advancement. The great number of unskilled jobs available "provided a haven for illiterate adults" (Hymowitz 1981). By the mid 1950s only slightly more than one-third of the 25 years-and-older population had completed high school, whereas today, less than one-third of the same age group has not graduated from high school. By the mid- and late-1970s, it was not uncommon to see educational requirements for four entry levels: high school at the lowest level, two-year community or technical college for higher-level clerical and craft; four-year college for lower managerial; graduate school for mid-management and professional (Noyelle, 1984).

Second, the concept of what constitutes illiteracy is changing. Traditional concepts of literacy were static—based on one's ability to recognize and write simple words. More recently, it has been recognized that literacy skills are seldom used in isolation; that speaking, listening, and basic mathematics are sufficiently integrated with reading and writing to be included in the concept (Ballas 1985). The Adult Performance Level (APL) Project (Northcutt et al. 1975) defined literacy by degrees of functional ability and also recognized a dynamic quality—that functional ability changed as industry advanced technologically.

Third, our stereotyped ideas about the kinds of persons who constitute the illiterate population are being challenged. Contrary to the popular concept of the illiterate population, (1) the majority are native-born white Americans; (2) many are stable family members and solid citizens with long histories of valuable and productive employment; and (3) a surprisingly large number have used hard work and extraordinary ingenuity to gain professional and managerial positions.

At the same time educational requirements are increasing, an estimated 2.3 million additional functionally illiterate adults are added to the population annually (*Business Week*, April 16, 1984). Sources include high school dropouts and graduates, legal and illegal immigrants, refugees, and others with limited English proficiency. The percentages of blacks and of Hispanics who are functional or marginal illiterates are disproportionately high—44 and 56 percent respectively. And although many enter basic skills programs, not all complete successfully; therefore, they are added to the pool of functionally illiterate who are seeking employment.

In spite of the increasing interdependence of industry and education, there has been little communication between the two on industry's skill needs. A survey of corporations, schools, and unions by Henry and Raymond (1982) for the Center for Public Resources (CPR) showed that from industry's perspective high school graduates as well as dropouts exhibited pervasive skill deficiencies across job categories, types of skills, and types of companies. Moreover, a lack of communication between industry and the school systems—regarding the level of basic skills needed and the seriousness of deficiencies in job applicants and employees—inhibited preventive measures. The survey respondents indicated severe discrepancies between the level of job requirements and the competencies possessed by newly hired persons for at least half of their job categories. Whereas corporate executives found youths' skills in mathematics, science, and speaking/listening to be low, school officials viewed them as adequate for employment.

Portending even greater problems in the future is the projection that the human resources pool upon which industry depends for employees will shrink both in quantity and quality. The U.S. Census Bureau projects from 1981 to 1995 a 22 percent decline of young adults available for employment. This decline will be even greater in some states. Moreover, as the total young adult population shrinks in size, a greater portion will come from disadvantaged and at-risk categories.

Functional illiteracy takes its toll on private industry in lost productivity, wasted material, damaged machinery, and hazard to employees. Examples abound. Spelling errors at a major insurance company required that 70 percent of their typed correspondence be redone at least once; in a factory an employee's inability to read a ruler resulted in 700 dollars worth of sheet metal being wasted in one morning; the inability of employees to feed numbers accurately into a computer purchased for inventory and scheduling cost one million dillars to correct, wiping out anticipated savings from the new equipment (Hymowitz 1981); a worker's attempt to repair a machine by following pictures provided with the text in a repair manual resulted in a quarter of a million dollars damage on the machine. Inability of workers to read safety signs, chemical content designations and instructions for complex machinery result in accidents adding billions of dollars annually to workers' compensation and industrial insurance (Kozol 1985).

As the quality of basic skills preparation becomes increasingly related to productivity and profitability, companies are finding it imperative to become directly involved in the education of their employees. Programs, often in cooperation with the schools, are aimed at providing remedial training both to new entrants (Lusterman 1977) and long-term employees. For the latter group, the cost of encouraging, developing, and retraining good workers is less than the cost of terminating good but "topped out" workers and hiring others to replace them (Stoker 1980).

Because of differences in focus, terminology, and methodology research has not provided a clear picture of the extent of basic skills training in industry. In the mid 1970s, a survey by Lusterman (1977) showed that 11 percent of 610 responding corporations offered basic remedial courses during or after work; about 75 percent of corporations in the Henry and Raymond (1982) Center for Public Resources survey carried out some kind of basic skills training; Duggan (1985) estimated that 8 percent of courses offered by employers during working hours are remedial; and Kuehn (1986) stated that around 30 percent of America's largest corporations offer remedial classes to employees.

The extent of corporate training resources committed to remedial education is also unclear. In Lusterman's (1977) survey, about 1 percent of total training expenditures went for remedial courses reaching about 1 percent of total participants; Timpane (1982) reported a range of 1 to 8 percent for corporate educational expenditures used for remedial programs; and Duggan (1985) placed at less than 1 percent the total company training funds spent on remedial education.

Although data are not sufficient to provide a comprehensive or definitive picture on the level of industry involvement in basic skills education, three observations seem safe. First, because of greater availability of funds, more large than small companies are involved in basic literacy education. Second, the amount of basic skills education is difficult to assess because many remedial type courses are offered in managerial and professional training programs (Eurich 1985). Third, companies have traditionally been slow to invest resources in basic skills programs because they do not see a clear or immediate return on their investment (Morse 1984). It also seems safe to project that as technological change accelerates and the youth population declines, companies will begin to recognize the return on their investment.

This report provides a closer look at seven industry-based approaches to addressing literacy needs of employers. Criteria for the programs to be included in the study were developed jointly by a panel of experts and National Center researchers in a meeting convened at the National Center in April 1985. The panel members developed the following criteria:

- The programs should be ones sponsored by the companies for their own employees.
- The sponsoring companies should have broad geographical representation.
- The companies should be of various sizes.
- The programs should vary in their date of origin.
- The programs should be managed by the company, an educational provider, or a union.
- The companies should represent diverse industries.
- The companies should be willing to serve as case study sites.

Eight company- and one union-based programs were selected for inclusion in the original study. The six companies and the union that agreed to be identified by name are the following:

- Onan Corporation, Minneapolis, MN
- Philadelphia Hospital and Health Care District 1199C, Philadelphia, PA
- Planters Peanuts Division of Nabisco Brands, Inc., Suffolk, VA
- Polaroid Corporation, Cambridge, MA
- R. J. Reynolds Tobacco Company, Winston-Salem, NC
- Rockwell International, Denver, CO
- Texas Instruments, Inc., Austin, TX

The researchers visited each program site for one to two days between June and September 1985 and interviewed training program managers, company officials, union officials, supervisors, employees, and educational service providers. These unstructured interviews explored the company's or union's history and origins of the basic literacy program, the company's basic skills needs, employee and/or non-employee participation, the program content and instructional processes, and approaches to evaluation and assessment.

The aim of the project was exploratory—that is, to do in-depth studies of a small number of programs. Therefore, conclusions drawn in the Synthesis of Findings must be considered tentative. Also, site selection processes keyed on programs that served completely illiterate employees—i.e., non-readers—as well as functionally illiterate ones—i.e., those with low basic skills. Therefore, although a variety of industries are represented, most of the programs originated in the manufacturing sections of large companies. After the programs were initiated, however, office workers often took advantage of them.

CHAPTER 2

ONAN CORPORATION, MINNEAPOLIS, MN

History

Onan Corporation was founded in 1927 by David W. Onan who began by making small portable electric generators from generators and engines that he purchased and connected. By 1932 he had developed his own small gasoline air cooled engine and alternating current generator; and during World War II his company manufactured over half of the portable electric generators used by the Allied Forces. Today, Onan is a world leader in the manufacture of portable and stationary generators, and gasoline and diesel engines of all sizes. In addition, it manufactures a complete line of energy control and switching devices to transfer power from regular sources to standby generators under emergency conditions.

After restructuring the company from a family partnership to a corporation in 1946, the family continued ownership and management until 1960. And though the company has changed principal ownership through a series of mergers—with Studebaker in 1960, with Studebaker-Worthington in 1968, with McGraw-Edison in 1979, and with Cooper Industries in 1985—it still bears the mark of a family-run company. Settling into a post-World War II economy with unchallenged leadership in its field, Onan became known as a company that takes care of its employees in matters small and large. A company vehicle starts stalled cars in winter, and work-related education costs are fully paid by the company. Turnover is extremely low; the average age of employees is approximately 40 years.

Since the late 1970s, however, greater foreign competition and accelerating technological change have influenced a corporate shift to more automated production processes and a more technically skilled work force. The impetus for addressing basic education skills within a broader context came in 1982 when the manager of machinery and modeling in the Electrical Products Division decided to offer an on-site course in geometric dimensioning. Employees in a higher-than-expected enrollment soon became frustrated because of a lack in basic education skills—reading and simple mathematics—necessary to learn the technical material.

It soon became clear that in order to offer more technical courses, the company would need to address basic education deficiencies. A needs assessment was performed by consultants, involving over 600 workers to determine their basic education needs and interests. Results prompted the plant to offer a more comprehensive on-site program that included basic education and pre-technical courses. Initially offered exclusively to manufacturing employees, the program has since been refined and opened to all employees. Skills development has now begun to be regarded as an important deterrent to staff reduction.

Basic Skills Requirements

One of the lowest entry-level positions in the Electrical Products Division is that of assembler, a job that carries no technical educational requirements. Nevertheless, the company seeks persons with at least a high school education to fill the position. Currently, the only reading and writing requirement for the assemblers is that of reading data sheets and filling out daily production logs—both involving mostly numbers; instruction or training is by example.

As automation is introduced, however, only a limited number of people are being hired without prior specific skill. An automatic line is being introduced in Engine Assembly; several million dollars worth of automated assembly equipment is currently being installed for the production of a series of generators, and each station will be computer numeric-controlled, requiring a knowledge of programmable controllers. Whereas in the past assembler's work was virtually all manual, now assemblers will need some computer literacy. In positions a step up from the line asssembler, both stocker assemblers and utility assemblers are required to use the computer to locate inventory.

In the metal working trades at Onan, employees are being encouraged to upgrade their skills. Persons unable to operate sophisticated new equipment are being moved to lower-skilled positions. The job classifications that are surviving are those that require computer-machine skills. Similarly, maintenance skill requirements have been elevated to include responsibilities for maintenance of the new automated machinery.

The definition of *basic* is shifting upward at Onan so that basic is now becoming that which was once semi-technical. In the expanded definition, the basic skill package includes mathematics through algebra, geometry, trigonometry and statistics; reading at the level required to learn the mathematics; and computer literacy. Writing, though not considered crucial at a high level for most technical jobs in the company, is regarded as crucial to self-esteem and important in other areas of life. Upgrading efforts include not only hiring applicants who possess those skills but also training unskilled persons within the company.

Program Structure

Training and Development is one of four departments (along with Employee Relations, Compensation and Benefits, and Staffing) in the Human Resources Division. Included in its responsibilities are corporate-level training, performance planning and evaluation, career development, and special programs for individual divisions, departments, and managers.

Both off-site and on-site programs are provided through Training and Development for addressing basic education needs. For off-site programs, the Education Assistance Program advances tuition costs for any course employees take, whether directly related to current jobs or related to jobs potentially available at the company. Employees are required to repay the company for courses that are not successfully completed.

On site, the Manufacturing Education Program is aimed at increasing technical skills in the mechanical, electrical, and quality assurance areas among the approximately 650 hourly employees of the 1,200 employees in the Electrical Products Division. Serving as prerequisites to courses in the three technical skill areas are a series of general skills courses in communication, computers, and math. The Manufacturing Education Program allows students the flexibility of completing the desired number of courses in one or all three areas as long as prerequisite skills are demonstrated.

A more recent development in on-site basic education is STEP (Strategic Training and Education Program), the counterpart to MEP, for maintenance employees in the Corporate Services Division. This program's objective is to provide opportunities for maintenance employees to learn the technical skills required for maintaining the new automated machinery coming into the plant at an increasing rate. The technical component in this program will be tailored to Maintenance Department needs.

Instructors for the basic skills components of in-house programs are supplied by Metro North, a consortium of eight school districts in the Minneapolis area that joined forces to offer community education programs. Their involvement in industry-based education grows out of a larger perspective on adult basic education. In the highly flexible relationship between Onan and Metro North, instructors, though responsible to the Metro North Directors, are encouraged to identify closely with the company. Arrangements for course loads and assignments are usually made by the instructors and reported to the director.

Employee Participation

There is no formal assessment of the educational level of entering employees at Onan; rather it is determined as nearly as possible from the job application and interview process. Currently, the company is no longer hiring applicants with entry-level skills. Furthermore, it is encouraging low-skilled production workers already on board to enroll in its technical education programs—in the areas of mechanical, electrical, and quality assurance skills—to avoid becoming technically obsolete.

The Manufacturing Education Program, which addresses both the basic education skills and the technical skills in the company's priority areas, is based on an initial needs assessment involving over 600 production employees plus top managers and administrators. The basic education curriculum is as follows:

Communications

- Reading I and II
- Study Skills
- Writing Skills I, II, and III

Computers

- Introduction to Computers
- Computer Programming

Math

- Math Refresher
- General Math
- Shop Math
- Algebra I and II
- Geometry
- Trigonometry

For the initial offering, a self-assessment exercise in mathematics was given with answers provided on the back to allow employees, in privacy, to determine their appropriate starting level. Three levels of math, algebra I and II, geometry, and trigonometry, serve as prerequisites to progressively higher technical courses in the three skill areas—mechanical, electrical, and quality

assurance. Courses may be taken in from one to all three areas, in succession or simultaneously, as prerequisites are completed. MEP courses may also be taken in combination with off-site courses, but, in any event, only two may be taken per quarter.

To ease the enrollment process, a catalogue of course offerings is distributed before the start of each quarter. A registration form provided in the brochure is filled out and mailed to the Training and Development Department; confirmation of enrollment is returned to the employee. Application for the MEP is automatically an application for the Education Assistance Program, and as is the case for enrollment in off-site courses, all costs are paid for courses successfully completed.

Many employees enrolled in MEP have progressed through the courses as a group, and largely with the same instructors when new courses were offered. For these "MEP regulars" there is little need for assessment. As new employees enroll, however, on the first day of classes they are given worksheets to assess their appropriate class level and are placed accordingly. Certificates of completion are filled out by instructors for personnel files.

Instructional Processes

There are five MEP instructors in basic education, all supplied by Metro-North. To teach through the consortium, they must be certified by the State of Minnesota, though not necessarily in the subject area of instruction because the program does not award credits. Though the salaries are lower than those of regular teachers, Metro-North looks for teachers who are committed to part-time work, are not moonlighters, and are willing to be retrained to teach adults.

The criteria for the courses are that their content be adjustable to meet Onan's needs and that their conduct be flexible to meet employee learning styles. Classes are designed to be nonthreatening: instructor-employee relationships are on a peer rather than superior/subordinate basis; there are periodic self-graded assessments, but no tests; there are no grades and no failures, provided the employee attends class. Generally, the classes are scheduled for fifteen weeks (three quarters per year) but individuals may complete the course early or continue past the deadline. Classes are held in various plant lunch rooms once a week, in two-hour sessions immediately after the first shift and immediately before the second.

Evaluation

Program evaluations, at this stage of the MEP, have been limited to the assessments of course management and preparation solicited by instructors of students at the end of each quarter. There is no attempt in these to draw a direct relationship between basic skills and increased technical capacity or production efficiency. The Training and Development Department has developed a one page form primarily as a trouble-shooting tool, for students to rate the classes from excellent to poor on course administration, content, and applicability to jobs. Plans also include periodic sessions with MEP regulars to gather feedback on course administration and on the question of whether the content has prepared them for progressively higher courses.

CHAPTER 3

PHILADELPHIA HOSPITAL AND HEALTH CARE DISTRICT 1199C, PHILADELPHIA, PA

History

Immediately following the organizational victories of the National Union of Hospital and Health Care Employees (AFL-CIO) during the early 1970s, the newly established District 1199C in Philadelphia began negotiating for a Training and Upgrading Fund. The leadership of District 1199C followed the example of District 1199 in New York, which had established a Training and Upgrading Fund in 1969 as a result of their successful collective bargaining efforts.

Establishment of District 1199C's Training and Upgrading Fund in September 1974 reflected the determination and commitment of the union, combined with overwhelming support of the 1199C membership for upgrading opportunities. Indeed, from the beginning, one of the major goals of the National Union of Hospital and Health Care Employees has been to win for its members the right to advance themselves economically and socially by providing them with the educational opportunity needed for higher-paying jobs in the health care field.

This District 1199C fund was formally established by an Agreement and Declaration of Trust that embodies the goals and objectives of the fund. A board of trustees, comprised of an equal number of union and employer representatives, was then established to administer the fund. Representatives from nine of Philadelphia's major hospitals and union representatives signed the original trust agreement. This agreement dictated that the District 1199C Training and Upgrading Fund was to be nonprofit and educational, supported by employer contributions. These contributions are derived from collective bargaining between the union and individual employers.

The Trust Agreement for District 1199C's Training and Upgrading Fund spells out its purposes. The trust fund intends to—

- alleviate existing shortages of health care personnel;
- increase health care employees' opportunities for skills improvement, promotion, advancement, and upgrading;
- provide increased health care employment opportunities;
- recruit employees for the health care industry;
- conduct ongoing research into the health manpower needs of hospitals and other health care institutions; and
- seek financial support from federal, state, and municipal governments, as well as from private agencies, in order to meet the ever-growing training needs of health care employees.

Carrying out the administration of the fund are an 18-member board of trustees and a director. The director coordinates the efforts of a 16-person teaching staff.

The major focus of courses offered is training at a post-high school level for 15 occupations in the health care field. Union members may also enroll and be funded in any health-related program in any outside college or university. From the beginning, however, District 1199C's Training and Upgrading Fund has also been concerned with basic skills. The fund first offered ABE and GED classes in conjunction with a community college in Philadelphia. After one year, the program became linked with the Philadelphia School District. In 1981, the fund asked the state for direct funding in support of ABE and GED classes. These ABE/GED classes run year-round on an open entry- open exit basis. Since 1977, the fund has also provided a Pre-Allied Health Program to improve job-specific basic skills. This program operates periodically, depending on different occupational needs recognized in the community. It is sometimes funded by employers and sometimes by government or private foundations.

Program Structure

It is important to note that the purpose of all the adult basic skills programs offered through the fund is to enable people to enter training in health care occupations at a post-high school level. Even those enrolled in GED classes have this goal.

District 1199C's fund serves 12,000 employees in metropolitan Philadelphia, representing 35 hospitals and health care units. Other funding from federal grants from the U.S. Departments of Education, Labor, and Health and Human Services—in addition to state and city educational grants such as JTPA and adult education—makes training available to adults in the community-at-large who qualify. In addition to the 12,000 employees mentioned, 200 adults receive literacy training per year. Demographically, the employee group is predominantly female, black, and middle-aged. ABE and GED students may or may not be employees; they need only be residents of Philadelphia. Nonemployee students meet in their own classes, apart from students referred to the fund by sponsoring employers. JTPA-sponsored training is open to residents of Philadelphia who are financially in need. An overwhelming majority of these students, many of whom are dislocated workers, are black females with a median age of 30. Students benefitting from the fund, who are employees concurrently, represent health care occupations such as the following: hospital technicians, nurses, aides, and dietary and maintenance support staff.

The fund has a distinct linkage with vocational education through the Philadelphia Academy Program. The Health Academy, located in two Philadelphia schools, is staffed by the school district but controlled by a board of health industry representatives. The District 1199C Training and Upgrading Fund's director serves as executive director of the Health Academy and is responsible for selecting the teaching staff. Students are Philadelphia youth interested in preparing for health care careers.

Participation

The training fund experiences a steady flow of students for JTPA-sponsored basic skills courses. The fund has its own intake system and advertises through a network of community organizations. Union members, on the other hand, are recruited by the union and to some extent by their employers on an ongoing basis. Recruitment by the fund generally occurs through union delegates, bimonthly newsletters, employment services, and training referrals.

The average period of participation for ABE/GED students is one year. Attrition is minimal, with a 10 percent maximum rate per class. Reasons for attrition usually center on the academic distance of the student from an achievement goal. Students who drop out tend to be discouraged about their slow progress. Recently, the fund's staff has noted that students who foresee their job being threatened are more willing to persevere. There is a waiting list for state-funded basic skills training classes.

Two instruments are used in assessment of basic skills. The Adult Basic Learning Examination (ABLE) is used to assess skill levels at grades 0 to 8. The California Achievement Test (CAT), Levels 14-19, is used to measure ninth grade abilities and above for GED students. Employers are, of course, responsible for detecting skill deficiencies among employees who are referred to the fund for training. Often, this process is simply the task of completing the hospital's application. Hospitals do not give a test for math skills. The selection process is straightforward. The fund always accommodates union members and essentially "takes all comers," says the fund's director.

The measure of a student's progress is equally straight-forward. As further skills training is the usual student goal in basic skills classes, the standard measure of progress is qualifying for another more advanced training program.

The fund's basic skills training costs the students nothing. Employers underwrite the basic skills classes of their employees. Grants cover the fees of JTPA and other non-employer-funded basic skills classes. The rewards of completion for students are that they either qualify for further training, or they keep their jobs and/or perhaps become licensed in their field.

Basic Skills Requirements

The basic skills expectations of hospitals in Philadelphia until recently have been unformalized, according to the director of the fund. The hospitals did not take an active role in the detection of basic skill deficiencies of employees. Recently, however, because of the need for retraining employees, hospitals have begun to take interest in the fund's ABE and GED programs. The fact that ward clerks, for example, now have to use the computer has alerted hospitals to basic skill needs. In another instance, a hospital found that the whole service cohort had difficulty reading and following instructions. Another common problem that hospitals have found with health care staff is a lack of verbal communication skills.

Basic skill deficiencies that the fund concentrates on involve reading, writing, and math. Increasingly, computer literacy is a focus as well. Technology, especially represented in the widespread introduction of computers, has had a resounding impact on the fund's involvement with basic skills instruction. Administrators in the health care industry have come to realize that if they are to protect their employees' jobs, let alone career progression, they must provide basic skills training.

The District 1199C's Training and Upgrading Fund is in the unique position of serving both as an advocate for union employees' welfare and as respondent to employers' perceived training needs. In at least one instance, while collaborating with the Medical College of Pennsylvania, administrators of the fund were able to convince employees to participate in the basic skills training. First of all, administrators addressed the perception of union members as to just how powerful their union is. They emphasized that the impact of technology is so powerful that jobs are no longer secure in the health care field despite employees' membership in the union. In this facility employees became much more willing to listen to their employer's urging for basic skills training.

Instructional Processes

ABE and GED classes are taken on the employees' own time. For the Pre-Allied Health Program, however, employees can take a leave of absence. A cost-of-living stipend is available from an employer-funded pool. Variable sessions are timed to accommodate shift work. These times include 9:00 to 12:00 a.m., 3:45 to 6:15 p.m., and 5:30 to 8:30 p.m.

Classes meet either in union-supplied classrooms or at member hospitals. The union utilizes its own three-story building in downtown Philadelphia. Five more classrooms are rented. The union classrooms have no special features other than office equipment. Hospital-site classes offer the students occupationally related materials and equipment. The hospital-site classes are held periodically, and usually for a short term.

ABE/GED instructors must be licensed by the state. The training fund provides all instructors for its training programs. For the Pre-Allied Health Program, teachers must be certified and have experience in adult education. The literacy program has five instructors, one counselor, and a part-time coordinator for ABE/GED; it has a coordinator-teacher and three instructors for Pre-Allied Health. The ratio in all basic skills classes is 20 students per instructor.

A range of instruction techniques and methods are implemented in the fund's basic skills classes. Both group and individual activities are used. Unique problems that are obstacles to acquiring basic skills are addressed through special needs techniques. The main textbooks in use are the Cambridge and Contemporary Books series for basic skills instruction.

Evaluation

Evaluation of students' progress in basic skills classes is accomplished through instructor testing and GED exam results. Employer feedback, which has been positive, is a new phenomenon for administrators of the fund. An informal practice of measuring impact has been the demand expressed for the fund's basic skills classes. There is a waiting list of nonemployees wishing to enter these classes. Another measurement of impact has been the rate of union member participation in basic skills classes, which has been approximately 4 1/2 percent.

With one exception, the fund's effectiveness in its basic skills effort to assist both workers and the health care industry seems well established. A freak experience occurred with one Pre-Allied Health class. All the students got jobs as a result of improving their basic skills, but not in the health care field. It seems that Christmastime tempted them away from training further to accepting seasonal employment.

What is the prognosis for the future? If anything, it is one of greater demand, given employers' new awareness of technology's increasing the need for basic skills competency in health care workers.

CHAPTER 4

PLANTERS PEANUT COMPANY, SUFFOLK, VA

History

The Planters company plant in Suffolk, Virginia, was one of two facilities operating in the United States to process and package peanuts and other nuts. The plant was aging. Most of the hourly-wage occupations were in assembly, packing, and quality control. Special emphasis was placed on product control because human consumption demanded strict enforcement of food standards.

The company came to Suffolk in 1916, and remains today as the principal employer of 750 hourly workers and 150 salaried employees in this community of 28,000 people. Most of the workers walked to work and looked to Planters for leadership in community affairs. Due to the community's low education level—over half, 53.2 percent, of the population in the city of Suffolk have not completed high school, according to the 1980 census—a literacy program for workers at the company plant was instituted by Planters and the United Auto Workers in 1978.

This program, Planters Employee Training (PET), has operated continuously since 1978. It was a cooperative venture among Planters, the Suffolk City Schools, and the Virginia Department of Education. Planters provided the space, equipment, and supplies for instruction, and paid employees for two hours of their four-hour instruction per week. The program was located in the plant adjacent to the cafeteria, in one large classroom divided into three sections with folding doors. Bright, cheerful bulletin boards and exhibits decorated the room.

Up to 40 employees participated in the program, which operated during the nine months approximately equivalent to the school year. The Suffolk school system employed PET teachers through its Department of Vocational and Adult Education. Some reimbursement of salaries was received from the State Department of Education. This voluntary program occurred on the employees' own time at no cost to them, usually before or after work.

The objective of the program was to provide Planters hourly-wage employees with an opportunity to improve their reading, writing, and math skills in order that they may—

- perform better in their present jobs
- become eligible for promotion
- become better citizens of the community
- experience the personal satisfaction that comes from learning.

Employee Participation

The staff resources dictated a program limit of 40 persons. The program has operated at near peak capacity in recent years. For the 1984-85 school year, however, enrollment was down; this was attributed to plant layoffs. During that year, 29 students were enrolled, 11 males and 18 females. Seven persons withdrew during the year. The previous year, 34 students had been enrolled, 14 males and 20 females. Of these, five had withdrawn from the program. Reasons given for leaving were health, family problems, and conflict with working hours. The median age of participants was 47 years for males and 50 years for females. The program was structured as an open-entry, open-exit, individualized system. In fact, most of the participants tended to remain for multiple years. Recruitment occurred during two weeks in the summer when employees could inquire about the program. Notices were posted throughout the plant. Some employees enrolled because of positive comments from fellow workers. This year, the program director talked with plant supervisors about persons needing the program.

Intake assessment of new participants was done with the Adult Basic Learning Examination (ABLE) test, published by Harcourt Brace Jovanovich, Inc. This non-threatening test covered eight years of school achievement. Test results allowed students to be placed in one of three groups. The groups were Level I, grades 0-4; Level II, grades 5-8; and Level III, grades 9-12; pre-General Educational Development (GED). Preference was given to Level I students, but there were only six students in Level I, fifteen in Level II, and eight in Level III.

Reading and math achievement were measured at the beginning and end of the school year. An analysis of records for the 1982-83 school year showed 45 persons had been tested. The program had resulted in average gain scores of .49, nearly a half grade level in reading, and .65, an even greater gain in math. Scores range from negative gains to a gain of more than two grade levels this year in both reading and math. Gain scores had improved by the 1984-85 school year. Average gains of .6 grade level in Reading and .8 grade level in Math were recorded. Posttest scores in 1985 were 7.1 in Reading and 7.3 in Math.

Students received reinforcement for achievement on an almost daily basis. Individual assignments were checked daily by the teacher, and much of the instruction proceeded on a one-to-one basis. At the end of the nine-month school year, closing exercises brought participants and company officials together around the theme, "We Are a Proud Enthusiastic Team." Awards were presented in reading, math, and English, Overall Academic Accomplishment, and Cooperative Team Work. Fifteen of the 22 students enrolled at the end of the year participated in the event. Students received thank-you letters from company heads and one student remarked that the Quality Control Supervisor had congratulated her for graduating from the program.

Probably the greatest reward for participation in the class was the increased feeling of self-worth generated through learning. Some students were able to read their names on company time cards for the first time. Others helped their grandchildren with homework. Their appreciation of the opportunity to participate in this program was voiced in comments such s these:

- "The more you learn, the more you wish to learn."
- "I feel better about myself."
- "I have improved on so many things that I didn't get when I was in school, like decimals, fractions, dividing, reading, and spelling."

The last comment was from a packer indicating that he may want to try for a job in quality control now that he has improved his skills. Employee participation for some was driven by the desire to improve themselves. The ability to read and write was a factor in applying for better jobs at the plant.

Instructional Processes

This literacy program was staffed by three part-time teachers. The Level I class was taught by an elementary reading teacher; Level II by a teacher who held a degree in Elementary Education; and Level III by the program director, who held a master's degree in adult education. They taught 35, 20, and 12 hours per week, respectively. Teacher qualifications called for a college degree, experience in working with adults, enthusiasm, flexibility, and patience. The students had many good things to say about their teachers, such as the following:

- "They are nice teachers; they have the patience, and they will help you."
- "The teachers are one of a kind . . . never too busy to solve a problem."
- "They stick with you until you get it."

The Planters' programs concentrated on basic skills such as reading, writing, mathematics, and communication, both verbal and written. Often students would talk poorly and write correctly. On the other hand, many of these students did not use banks because they couldn't open an account or fill out a deposit slip. Subjects taught included spelling, health, and social studies, supplemented with topics on consumer needs such as what to do with your money.

The Cambridge Workbooks from New Readers Press were used for Level I students. Occasionally, Language Master cards were used with magnetic tape for pronunciation of words. More than one subject was taught in each two-hour period because teachers wanted to keep students' interest. Discipline was not a problem because these students wanted to learn. Class members learned quickly that other class members wanted to use their time effectively. Instructional transactions were highly individualized with some group discussion. Students most often responded directly to questions from the teacher but also used workbooks.

Evaluation

Teachers, supervisors, and the plant manager felt there were positive employee benefits. The effects of the PET program on productivity in the workplace were difficult to quantify, but occasionally they have been documented. For example, a mechanic in the program learned to read so he could find a .007 bearing in supply rather than ask another person to get it for him, thereby saving time. A checker was taught the quickest way to multiply, subtract, add, and divide. A packer who was taught to read was able to determine where the boxes are going and to pack them appropriately. A loader using a fork lift and pallets was able to work faster becuse he could now multiply the number of boxes in a stack times the number of stacks to determine the quantity to be moved rather than counting each box separately.

These isolated examples were cited to give a flavor of the job-related benefits accruing to Planters as a result of this program. Although the examples did not include benefits to the individuals as citizens in the community, two of the persons interviewed mentioned new roles assumed in their church as a result of improved speaking skills. Others mentioned such fundamental benefits as being able to print their names and fill out forms, knowing for the first time what a stop sign means, and being able to identify their name in print on a time card or check. The program benefits were basic and pervasive. These participants have grown as family members and citizens, as well as employees. Clearly, Planters, in concert with the local union and education system was making a contribution to the community above the increase in plant productivity.

CHAPTER 5

POLAROID CORPORATION, CAMBRIDGE, MA

History

Polaroid was begun in 1937 by Edwin Herbert Land as a research enterprise in light polarization and as a manufacturer of polarized light filters. In 1947, Land demonstrated the first instant camera, and today the corporation is in the business of research, design, and manufacture of instant photographic products—film, and still and moving cameras. Several factors in the development of the corporation led to its current involvement in company-based adult basic education.

From the beginning, Polaroid's technological developments in the production of polarized light filters involved novel processes for which school-based instruction was unavailable. Land himself had dropped out of Harvard as a sophomore to pursue more vigorously his research in light polarization. In the 1950s, Polaroid's corporate plants were being constructed at the very same time that New England's textile mills were relocating to the South. Displaced middle-aged workers, many of whom had spent their entire working lives in the textile industry, were taught to be film assembly operators; returning Korean War veterans were employed as technicians and mechanics.

From 1950 to 1960, Polaroid quadrupled in size. In the mid 1960s, with the development of its new camera, the SX-70, the corporation decided to make its production a labor-intensive, hand assembly operation drawing on the underemployed population of Boston. Having begun the planning in 1965, the company intensified its efforts during the 1968-69 upheaval of Roxbury, a low-income, inner-city housing area, following the assassination of Dr. Martin Luther King, Jr.

While tuition assistance had been regarded as the pillar of employee development for those wishing to expand their education, many within the company lacked the prerequisite basic skills upon which higher education could be built. From 1960 to 1978, the corporation quadrupled again, but began downsizing in 1979 in the face of foreign competition and technological change. In 1970, a staff position was created to provide basic education skills, and a program was developed featuring Adult Basic Education (ABE), English as a Second Language (ESL), and General Education Development (GED) components. The unavailability of outside educational providers (there were no community programs near the plant, and Massachusetts' community college network was in its embryonic stages) dictated that the program be built entirely within house.

Basic Skills Requirements

There are no basic education requirements for Polaroid's entry-level jobs, those of hand-assembly operations. However, the increase in competence normally acquired in the work situation over time is unable to keep pace with the accelerating rate of technological change, creating a gap between technology and competence.

Old jobs that required muscles and little education, jobs in which laborers relied on management for all decisions, now require new skills such as computer operation and greater worker-centered management of the operation. The company has also moved into new areas—magnetics, battery technology, and others unforeseen a few years before.

Technological changes are having the effects of reducing demand for lower-level cognitive skills (e.g., literal recall and duplication as in reading a dial, and copying or reporting a number exactly as seen), and increasing demand for higher-order cognitive skills (e.g., inferencing and making generalizations, as in reading data, synthesizing it, and predicting trends).

The company's goal is to facilitate the availability of jobs to 1300 hourly employees by raising their sophistication in math and science to the criteria for midlevel technical retraining by the end of 1986. Because of Polaroid's scientific focus, literacy skills are regarded as important, but chiefly in support of math and science skills.

Program Structure

Education for both exempt (salaried) and nonexempt (hourly) employees is the responsibility of the Human Resources Development Group under the jurisdiction of the vice-president for personnel. The Polaroid philosophy requires that the two classes of employees be treated equitably with respect to educational opportunities.

In addition to a variety of nonstructured educational opportunities, there are four structured programs offered for nonexempt employees. Two are under a program director responsible for pretechnical development and are focused on skills appropriately acquired during the elementary through secondary school years.

(1) The Fundamental Skills Program is designed to provide remediation in basic educational skills; and

(2) The Technology Readiness Program is designed to equip employees with the necessary precollege foundation skills to function in the new technologies.

They serve us foundations for the latter two:

(3) The Technician Training Program is equivalent to a training/retraining program in the skilled trades; and

(4) The Polaroid Internal Technical Cooperative Program (PITCOP), in cooperation with Northeastern University, is a highly select technical degree program for either exempt or nonexempt, nondegreed employees.

Employee Participation

There are no prehiring tests of literacy; all literacy requirements are intended to be job-related. Employees generally become involved in educational programs to acquire skills needed to (1) function in a current job capacity, (2) move to another job, or (3) meet changing technological requirements.

The Fundamental Skills Program offers a variety of direct and indirect services to assist nonexempt employees in meeting competency requirements for improved job performance and job growth. Job-related basic skills criteria have been established for all nonexempt positions; and literacy, ESL, and basic math assessments have been developed and correlated to job tasks and training programs.

In the three-month probationary period given persons newly hired to learn their jobs, a combination word/picture assessment is administered to ensure their capability of complying with basic safety requirements. At this level, behavioral and not necessarily literate responses are desired. In the event the picture assessment is not passed, the results are documented and the safety-related word list and basic rules are built into the training process.

Movement beyond entry level is accomplished through a bidding process. Polaroid is a seniority-based company, and in the downsizing process prevalent in the company since the late 1970s, an employee faced with a loss of job may "bump" another employee with less job seniority at an equivalent level. The employee must show capability of performing in the new job with minimum supervision within 30 days. For employees who show competency levels below those required, the company assesses literacy needs on a case-by-case basis. An employee has a choice of enrolling in a class to correct the deficiency, moving to another equivalent job, or facing termination for unsatisfactory performance.

Fundamental Skills tutorials, classes, and labs are offered in basic math, ESL, reading, and writing according to need and demand throughout the company. Moreover, the program plays a consulting and advocacy role with the Reassignment Review Board for employees at risk either of loss of their job value (classification level) or of termination.

To meet changing technological requirements, the corporation offers the Technology Readiness Program to equip hourly employees with additional education skills in three broad areas—science and math, computers and instrumentation, and skills for sustained learning. The curriculum for each of the categories is listed below:

Science and Math

- Physics
- Basic Electricity
- Chemistry
- Pre-Algebra
- Algebra for the New Technologies
- Geometry/Trigonometry
- Statistics

Computers and Instrumentation

- Computer Literacy
- Instruments
- Tools and Equipment
- Digital Logic
- Basic Electronics

Skills for Sustained Learning

- Interperaonal Skills
- Speaking and Listening
- Writing for the New Technology
- Career Management
- Survey of Study Skills
- Reading for Technology
- Problem Solving

Within the scope of the Fundamental Skills Program, developmental math and science courses are made available for employees unprepared for the pace of the Technology Readiness Program or academic review courses.

Enrollment in Technology Readiness courses (1) requires supervisor approval of both assessment and entry, (2) is based on seniority, and (3) is limited to one class per employee per term. The assessment process certifies the level of competence in course prerequisites, and grants certificates of credit without enrollment for proficiency in course content.

The program is now being used as a vehicle for establishing a comprehensive self-assessment system on a variety of subjects. The program provides a means for employees to document proficiency in skills prerequisite to jobs or to courses they are considering.

Instructional Processes

All instructional staff for basic literacy skills are hired on a consultant basis. They are not necessarily required to have teacher certification, but they are expected (1) to be experts in their content areas, (2) to have grounding in adult learning theory, (3) to be grounded in the kind of culture in which we live, (4) to be sensitive to cross-cultural experiences, and (5) to be flexible in working hours. They are not directed in specific teaching techniques to employ, but are expected to have a good repertoire of techniques to use as appropriate.

Class times are flexible to accommodate instructors, employees, and plant requirements. Classes are generally held in two-hour sessions at the beginning, ending, or crossover of a shift. They may be offered on the company's time, the employee's time, or split between the two. Classes are held at Polaroid's facilities in Cambridge, and in Norwood, New Bedford, Freetown, and Waltham (suburbs of Boston).

Evaluation

Much of the program evaluation is informal; it consists of supervisors' acknowledgment of improved employee performance. The program gets organized feedback from instructors on employee performance. Teaching schedules include time to inform supervisors about relationships between the skills being taught and the job. Supervisors are asked to give feedback on employee performance during and/or following training.

From Technology Readiness Program funds, a formal evaluating process—one that allows employees to reflect on learning—is being developed.

CHAPTER 6

R. J. REYNOLDS TOBACCO COMPANY, WINSTON-SALEM, NC

History

R. J. Reynolds Tobacco Company is a wholly owned subsidiary of R. J. Reynolds Industries, a major international consumer goods industry with its corporate headquarters in Winston-Salem, North Carolina. The corporation consists of six operating companies with major interests in domestic and international tobacco, canned and frozen foods, cookies, crackers, confectionary foods, beverages, fresh fruits, and quick-service restaurant operations. Employees number 14,000 in the United States and 168,000 worldwide. R. J. Reynolds Tobacco Company was established in Winston-Salem in 1875. It grew rapidly during the fifties and sixties, allowing expansion within the United States and in other countries. Cigarettes are manufactured by R. J. Reynolds in 20 countries and sold by the company in 160.

R. J. Reynolds Tobacco Company has maintained a long-term interest in employee development. Currently, 20 courses are offered to management and professional personnel and 130 technical education courses are being developed and taught to R. J. Reynolds employees. Approximately 100 trainers and curriculum developers are employed by the company. The programs are administered by the Personnel Department.

Program Structure

The adult basic education courses for R. J. Reynolds employees were initiated by Forsyth Technical College in the fall of 1983; however, courses at the technical level have been offered by Forsyth since 1978. The courses in reading—the object of this case study—were being offered through the Adult and Continuing Education Division of Forsyth Technical College. Courses related to business and industry needs were offered in this Division through programs in the following four areas:

- Basic or academic skills
- Occupational skills
- Practical skills
- Health-related needs

These areas cooperate with each other and with other institutions to meet industry needs. For example, American Express plans to move into the Triangle area of North Carolina with 2,000 employees in need of retraining. Forsyth will be cooperating with Guilford Technical College and the University of North Carolina at Greensboro to help meet these training needs.

The basic skills courses were offered as needed, and taught by parttime instructors. The literacy courses in reading taught at R. J. Reynolds plant sites were noncredit, and fees were paid by the Forsyth Technical College. R. J. Reynolds furnished the facilities and encouraged employees to attend; Forsyth provided instructors certified in their area of expertise. Classes met for three hours twice a week for 11 weeks each; sessions were offered four times a year. Classes were voluntary and open to any employee of the company; however, employees attended on their own time. All of the employees attending were hourly-wage personnel.

The liaison between R. J. Reynolds and Forsyth was through the Coordinator of Adult Basic Education and the Academic Dean in the Adult and Continuing Education Division. An attempt was made to offer instruction at times and locations convenient for the employees.

Basic Skills Requirements

Enrollment in basic skills classes has been stimulated by the construction of a new computerized tobacco manufacturing facility at Tobaccoville, North Carolina near Winston-Salem. Employees were encouraged to apply for positions in this new plant containing high technology manufacturing equipment. The facility was scheduled to open in 1986.

A program entitled "New Generation Training" was initiated to help employees learn to operate and maintain equipment in this new plant. A reading test was administered to all employees interested in being transferred to the new plant. High-tech equipment required a machine operator to read the computer printout, recognize parts of the machine when trouble lights went on, and solve problems when the machine malfunctioned. One plant manager said, "I think the testing is the best thing that we have instituted so far to determine a person's capabilities."

Increasingly, quality control of manufactured products is becoming the function of individual machine operators. In the case of cigarettes, quality control is based on visual inspection; the high-tech equipment allows the operator to stop the production flow, adjust, and repair the equipment for better quality. Inspectors still spot-check the product at R. J. Reynolds, but the minute-to-minute responsibility for quality is in the operator's hands.

Employee Participation

Current enrollment in the four adult basic education courses being offered by Forsyth at R. J. Reynolds locations consists of 95 hourly-wage employees. Most were motivated to enroll by low reading test scores or a desire to improve their reading skill prior to taking the test. This voluntary course costs the employee nothing. The detection of skill deficiency, however, has created some anxieties. One student said, "I don't know why I'm here. They have the reading test, and I made 57. You've got to have 60 to pass." Many of these students lived within a 50-mile radius of Winston-Salem. Many lived on farms and engaged in very few reading activities.

Many of the current employees enrolled in the basic reading classes had been coming since the fall of 1983. The average tenure of class participants was nine months. This was sufficient time for accomplishment to be felt. One participant said, "Now I notice everything I see . . . I notice the name of the church bus. If I can't pronounce it, I think about the vowel sounds. Then I see." Many of the

participants felt a sense of pride when they began to help themselves and others. Note the following comments:

> ". . . then I'll be happy with myself. A lot of time, I will be behind a car and it will be from out of state."

> "My baby (age 16), and his mama couldn't work it out and I helped him. He took the paper to school and he got an 'A' out of it."

> "My kids are proud of me. They said, 'I think you need to go; it would do you good.' "

Many of these students read very slowly or with a lack of understanding. The classes were designed to increase reading speed and comprehension.

Instruction Processes

Folders were kept for each student. Most of the instruction was by lecture, discussion, and workbook. The instruction covered a broad range of topics associated with reading such as the following:

Sound-letter relationships
Number of syllables
Compound words
Contradictions
Endings
Word recognition
Listening and writing skills
Reading comprehension
Reading of advertisements
Filling-in of applications

The classes used the *Laubach Way to Reading* program. This program used direct instruction in an interactive mode between the instructor and one or two students. The self-contained workbooks, published by New Readers Press, encouraged the user to complete the blanks or mark illustrations following reading of the story text. The stories often related to job issues such as, how do I get along with others at work? Each of the five levels in this basic reading and writing program contained its own skillbook, teacher's manual, correlated reader, and checkup.

Evaluation

The Adult Basic Learning Examination (ABLE) was administered by Forsyth to determine the training needs of undereducated adults. This general aptitude paper-and-pencil test measured five areas including reading. Scores indicated which of three levels, grades 1-4, 5-8, or 9-12, was appropriate for the student. Grade norms for Levels I and II had been developed through correlation with the Stanford Achievement Test (SAT). In addition to the checkup, worksheets available in each student's workbook at the end of each lesson, the ABLE was administered at the beginning and end of each program year to determine gains made by students in the program. The North Carolina State Department of Education guidlines for adult basic education classes suggested that students should move up one grade level for each 120 hours of instruction.

CHAPTER 7

ROCKWELL INTERNATIONAL, DENVER, CO

History

Rockwell International is the product of the merger of two companies, (1) North American Aviation, founded in 1928 in El Segundo, California, and (2) Rockwell-Stanford, a Pittsburgh firm which began making truck axles in 1919 in Oshkosh, Wisconsin. The companies joined forces in 1969 during a period of public criticism of the aerospace company following on the heels of an incident in which three astronauts burned to death in the Apollo space capsule at Cape Kennedy, Florida. Today, Rockwell is one of the 100 largest companies in the world, with operations in four major areas: (1) automotive products, (2) aerospace, (3) electronics, and (4) general industries (energy products and systems and consumer products).

The Rocky Flats Plant, at the foothills of the Rocky Mountains outside of Denver, Colorado, is operated by Rockwell under contract with the Department of Energy to produce triggering devices for nuclear weapons, to engage in research on plutonium and plutonium recovery (for reuse, primarily from outdated weapons), and to perform research on alternative energy systems. In the late 1960s, the Rocky Flats Plant began hiring hardcore unemployed residents of the area into laborer and janitorial positions; union contracts, over time, allowed their migration into higher job classifications.

With technological changes that became more pronounced in the late 1970s-early 1980s, deficiencies in the basic education skills required for more complex jobs began to surface. The company initially attempted to persuade employees to enroll in area educational programs, but the effort was complicated by two factors: (1) the 6,000 employees worked in plant areas spread throughout the Denver metropolitan area, and educational programs were difficult to localize in one place; and (2) employees were embarrassed over the prospect of returning to high school.

Rockwell became actively involved in the upgrading of basic education skills in 1978 when, in response to a perceived oil boom, it joined a consortium of federal, state, community-based, and organized labor organizations to establish the Rocky Mountain Energy and Environmental Technology Center (RME and ETC). The Center's mission was to train the state's disadvantaged population, and thus ensure an adequate supply of skilled labor for Rockwell and other energy companies. During its beginning phases, Rockwell managed the total RME and ETC operation. In 1983, the name was changed to Technical Education Center (TEC), and it was institutionalized as a part of the Community College of Denver, with Rockwell International maintaining financial and program responsibilities. In January 1984, the company hired for its training staff a person with a background in basic education skills.

Basic Skills Requirements

A high school diploma or General Education Development (GED) certificate is the minimum requirement for entry-level employees at the Rocky Flats Plant. For employees entering above the level of janitor, radiation monitor, or assembler, one year each of algebra and chemistry are specified in addition. Three factors that work together to influence basic skills requirements for entering employees are: (1) safety requirements with radioactive plutonium and other hazardous material, (2) the time and expense involved in security clearance checks in the hiring process, and (3) the ease of mobility from low-level positions to higher responsibilities in the company.

All employees are required at entry, and periodically thereafter, to pass a Nuclear Energy Safety Test. They are allowed three unsuccessful attempts at completion, after which they are required to attend reading remediation. To verify reading levels of employees who are involved in work with potentially lethal materials, the courts now allow a reading test based on a job task analysis as a method of screening. Concerned with the level of bias in reading tests, the training department is in the process of developing a reading assessment drawn from work samples—documents and materials required for reading on the job.

Because of the strategic nature of the plant's operation, it takes approximately one year from the time of application to complete security clearance checks and start employees on the job. The initial investment in employees is therefore very high. Moreover, with the strength of union agreements, employees starting at the lowest levels of the company—in janitor and materials analyst positions—may bid on job openings and may progress to higher jobs with more critical responsibilities, such as chemical operators or metallurgical operators, after being with the company for approximately three months.

Employees hired before there was a requirement for a high school diploma are faced with greater basic education skill demands brought on by accelerating technological change: skills acquired over years on manually-operated equipment are not necessarily transferrable to computerized numerically-controlled equipment. For example, the relatively simple operation by chemical control operators of turning valves on the plant floor has been replaced by computerized control panels requiring monitoring. Both the level and the volume of reading in the operating manuals have increased. Also, because the demand for labor has slowed, the company can afford to be more selective in its hiring process. The skills now considered as basic—specified as those which all employees should have—are these: general mathematics, algebra I, general science, one year of chemistry, and one year of physics. Reading at a twelfth-grade level is assumed, and Rockwell does not teach it directly.

Program Structure

Training, Administration, and Assessment (TAA), which assists the various operations at the Rocky Flats Plant in meeting basic education needs, is a part of Human Resources in the corporate structure. At the plant, TAA is one of three branches of training (the others are Training Program Development, and Management Development). It is responsible for (1) keeping records on all training (the federal government requires documentation of all certified competencies); (2) assessment of employees (both those who are having problems on the job, and those who come in for voluntary assessment before attempting postsecondary enrollment); and (3) providing classroom space for any plant training needs.

Actual instructors in basic skills are assigned to the various operational units. Another key function of TAA is the development and delivery of train-the-trainer classes, originally targeted for plant foremen and supervisors who are responsible for training on the plant floor, but currently expanding to include all basic skills instructors as well.

TAA is housed in, and operates cooperatively with, the off-site Technical Education Center, a branch of the Community College of Denver. For employees identified by TAA, the Center provides full assessment batteries or reading assessments as appropriate. Where reading assessments show an eighth- or ninth-grade reading level, TAA contracts with TEC for a given number of hours of instruction and reevaluation at the end.

TAA also attempts to identify employees whose reading difficulties suggest learning disabilities. In such cases employees are referred to the University of Colorado Speech and Hearing Clinic which is contracted to provide more thorough testing. If tests are positive, employees are expected to enroll on their own in one of the community sponsored programs.

Employee Participation

Though algebra and chemistry are specified requirements (in addition to a high school diploma) for most entry positions at Rocky Flats, neither the diploma, nor the specified courses, nor a required grade point is regarded as an indicator of competence. In the past, the company has found that many of those with diplomas who started in the lowest ranks—janitor, radiation monitor, assembler—have lacked the required courses, or did not retain the concepts over time.

To ensure that employees entering into progression programs have a foundation upon which to build further training, all are required to enter math remediation, though they may proceed at their own pace. For those hired into chemical operator or metallurgical operator positions directly, a three-week review in basic algebra and chemistry is required before moving to the plant site.

In addition to the remediation required for employees' entrance into progression programs, there are three other reasons for employees' entering remediation: (1) having a basic skill deficiency that affects job performance (usually a referral by Employee Relations); (2) having failed the Nuclear Energy Safety Test or the Industrial Safety Test three times; or (3) personal reasons (usually voluntary entry to brush up on a skill for further education). When a deficiency affects job performance, employees are given a specified amount of time in remediation in which to show improvement. If sufficient progress is not shown, they do not lose a job altogether, but are moved out of the new job and generally returned to the former position.

Rockwell pays for all work-related instruction including costs for off-site college attendance. Required courses are taken on company time, but classes for an employee's own promotability are taken on the employee's time. In some special cases, for employees with outstanding work records whom the company feels it will promote after remediation, class attendance is allowed on company time.

Instructional Processes

The plant's past experiences with outside instructors in basic education have shown employee dissatisfaction with the assumption of traditional "authority-subordinate, teacher-student" approaches to teaching. For that reason, all basic education courses are offered through "in-house" instructors who are involved directly with the operational units, rather than with Training Administration and Assessment. A production foreman teaches remedial math courses for those in progression programs, and three engineers teach basic skills to employees experiencing problems passing industrial or nuclear safety tests. An instructor from the Employer Services Program, a person cleared to work on the plant site, offers intensive tutorial assistance for employees with math or reading deficiencies that affect performance.

Teaching methods involve little stand-up instruction. Math courses are usually self-paced and computer-assisted with the instructor offering one-on-one assistance. Safety instruction and tutorials in math are both offered on a demand basis in one-on-one sessions. Milliken basic math and Eduware for Algebra I through IV, software programs designed for Apple IIe computers, are used. However, the plant is in the process of modifying McDonnell-Douglas' Applied Instruction System (AIS) to be used with IBM hardware for Rockwell in industrial and radiation safety as well as in math instruction. To assist instructors with course planning and teaching methods, TAA plans call for their inclusion in train-the-trainer classes.

Classes are taught at TEC and in a trailer, converted for instructional use, at the plant site. A new training facility to be constructed near the plant site will eventually house all training programs. To accommodate radiation safety requirements for changing clothes upon entering and leaving the plant, classes are scheduled immediately after or prior to the beginning of a shift.

Evaluation

The most significant effect of the basic education skills program since its establishment in 1984 has been its role in the fundamental change in relationships between union and management. Initially, training program personnel felt some apprehension on the part of the union to acknowledge that an employee was experiencing difficulty in a job because of a deficiency in basic skills. But the remediation and subsequent placement into the same or higher jobs through the program have contributed to a new level of trust between union and management. They have increased the credibilty of TAA and caused supervisors and foremen to refer employees to training as a preventive measure.

The program is also beginning to gain some recognition throughout the corporation. Although a dollar-and-cents figure has not been attached to program benefits as yet, the company feels the evidence is strong enough to begin evaluating. TAA plans to develop a tracking system on employees in the program and then to measure results at six-month intervals for comparison with nonparticipants.

CHAPTER 8

TEXAS INSTRUMENTS, INC., AUSTIN, TX

History

Texas Instruments (TI) started in oil field seismology in 1938, and with decentralization in the post-World War II years, blossomed into a multi-national corporation with over 45 plants in 20 different countries. Still involved in building seismic instrumentation and in seismic exploration, the company has become the world's largest manufacturer of semi-conductors. To this it has added a number of widely diversified operations: radar surveillance and missile guidance and control systems; calculators and educational learning aids; clad metals and controls for use in automobiles and appliances; and a data systems operation with computers and related items.

The Austin, Texas plant, with close to 3,000 employees in Data Systems, is one of a number of companies that provide the city with a reputation as an emerging "high-tech" center. At a community level, TI Austin is actively engaged in a collaborative effort with the business/industrial, governmental, and educational sectors. Called the Alliance for Effective Education, it addresses the technical skills in human resource development that are needed to accommodate rapid growth and technological change.

Internally, over the past few years, TI's efforts in human resource development have been broadening to include basic education as well as technical skill development. A move in that direction was prompted in 1983 when the company responded to a need to train higher-grade assemblers of twin circuit boards in test operations, an intermediate level function, and thereby to create opportunities for mobility from assembler to technician. To provide the necessary skills, a self-paced Test Operators Program was offered through TI's Learning Center. It soon became apparent, however, that the results were less than desired.

Austin Community College (from whose advisory committee the Alliance for Effective Education was an outgrowth) was approached by TI to offer the program in a classroom setting. A needs assessment to start employees at appropriate levels revealed a need to offer remedial mathematics and English prior to the more technical courses in electronics. In establishing the program, the company also decided to offer English as a Second Language (ESL) for the large Thai and Hispanic populations in the work force, and General Education Development (GED) for those who lacked a high school diploma.

Basic Skills Requirements

High school graduation is not a requirement for entry-level employment at Texas Instruments, and there is very little required reading for a beginning assembler. The next job grade within the assembler classification, however, requires some print reading, documentation, the ability to use measuring devices such as rulers and ohmmeters, and the ability to work simple equations. One

could not expect to pass beyond entry level until those skills are gained; sometimes, however, the market and an urgency to fill vacancies demand exceptions. No formal assessment of educational achievement is made prior to hiring, but assemblers are trained before being placed on the line and are tested to determine progress toward training objectives.

Presently the detailed nature of some assembly processes still requires hand-assembly and soldering. For some processes, faster and more accurate machines have reduced the need for mathematical calculations required earlier. Other changes, however, have pushed requirements upward. The need to interact with supervisors and other support personnel, and to participate in "effectiveness" (or quality) circles requires increased ability to communicate; the advent of new quality-assurance techniques has required more general knowledge of statistics; surface-mount technology for intricate assembly in smaller printed circuit-board spaces requires higher technical capability; the use of more automatic test equipment, though too rudimentary for technicians, has placed higher demands on assemblers for technical and problem-solving skills.

The test operator position, created to handle the testing functions and to bridge the mobility gap between assemblers and technicians, requires mathematics, written and oral communication skills at a high school graduate level, and electronics (touching on basic laws of physics) at a first-year technical school level.

Program Structure and Processes

The Test Operator's Program is coordinated by and administered through the Human Resource Development (HRD) Group. HRD is attached to the Personnel Department and is set up to respond to the human resource needs of the Data Systems Group. The HRD manager reports to the personnel director who is also the vice-president of the Data Systems Group.

Management development specialists within HRD are designated to respond to the general skill needs of the functional areas that may be supplied through TI's Learning Center or through other educational providers in credit or short-term noncredit programs, either on-site or off-site. They interface with training specialists in the various functional areas to determine what needs can best be satisfied ultimately by the functional area training specialists and what general training needs should be supplied by the management development specialists.

The Test Operator Program is offered in cooperation with Austin Community College, which provides assessments for appropriate starting levels and performs all classroom instruction in basic education prerequisites as well as the technical courses. Courses are offered on an as-needed basis. If enrollment does not meet ACC's minimum enrollment criterion, basic education courses can be taken on a self-paced basis through the TI Learning Center or taught on-site by TI supervisory staff until a sufficient number of trainees are prepared to take the technical courses through ACC.

Employee Participation

Though a formal assessment of skills is required for all employees entering the Test Operator Program at TI, it is not necessarily a determining factor for participation. For interested employees, Austin Community College administers the Flannigan Industrial Series, which tests for math level in addition to a number of related technical skill areas. The results of the tests are interpreted by ACC and shared with employees in individual counseling sessions. To maintain confidentiality of results, TI is provided only group assessment results unless a consent form is signed by the employee. Regardless of assessment results, the ultimate decision regarding program entrance still rests with the employee.

The primary objective of test operator training is successful completion of the technical courses in DC (direct current) and AC (alternating current). The basic education courses are offered as need for them becomes clear. Basic English and basic electronic math (with concepts through Algebra I) were included as a prerequisite. As suggested by the needs assessment, English as a Second Language (ESL), was added to facilitate the interpretation of technical material by the large Thai and Hispanic populations in the work force. The experience in basic education motivated a number of employees to complete high school, and a GED course was added.

TI's Educational Assistance Program reimburses employees—at the 100 percent level up to $300 per three-hour course, or at the 80 percent level beyond that—for courses leading toward a degree in a corporation-related job or career. One-shot job-related courses taken for credit through a college or university can also be reimbursed. All costs in the Test Operators Program are fully paid by TI.

Promotional opportunities are closely tied to program completion. At TI, all jobs are opened to employees before they are advertised externally, and certification through the program is included as one of the requirements for a test operator's position. With nonexempt (hourly) employees, priority for jobs is based upon seniority plus minimum qualifications.

Instructional Processes

Austin Community College supplies all basic education instructors for the Test Operators Program at TI from its Parallel Studies Division, which provides remedial education. Instructors must be certified by the State of Texas, which requires a baccalaureate degree and an appropriate occupational background to teach vocational courses. State certification for GED instructors requires a high school diploma plus six hours of inservice training. ACC, however, requires that they have a bachelor's degree in education or a related field and experience working with adults. In addition, ACC requires ABE and GED instructors to have the ability to (1) help adults in setting goals, (2) offer flexibility in course content, (3) individualize instruction, and (4) guide and motivate participants.

All courses in the Test Operators Program and in related basic education skills are held on site, immediately after the shift, in two-hour sessions. Duration of courses varies, depending on the needs of the students. The first program offered from eight to ten weeks in English, and thirteen weeks in basic mathematics and GED. Because the program is provided for people who are moving beyond their current jobs into new positions, courses are taken on the employees' time. Courses related to current job performance are offered on company time.

Evaluation

With the initial Test Operators Program, no systematic evaluation of impact on productivity was attempted. Austin Community College, however, requests periodic feedback from supervisors on employee performance after training. Human Resources Development regards as a rough indication of program benefit, evidence that participants in the classroom-based Test Operators Program (1) passed the test operators' program at a 100 percent success rate, while nonparticipants did not; (2) show improved job satisfaction on attitude surveys; (3) show satisfaction with training during performance reviews; and (4) show improved work performance as reported by supervisors.

CHAPTER 9

FINDINGS, SUMMARY, AND RECOMMENDATIONS

Synthesis of Findings

The characteristics of individual literacy programs were presented in chapters 2 through 8. Table 1 displays program features from the major topics discussed. They include: (1) the year of program establishment and change, (2) skill requirements, (3) participation, (4) structure, (5) instructional staff, and (6) evaluation. These features correspond to the major headings in the Synthesis of Findings. Although no single program will be fully represented in the synthesis, this section does show a rather general pattern for the programs visited.

Settings for Program Establishment

At the sites visited, approaches to industry-based literacy education can be divided into (1) traditional programs, and (2) "new" literacy programs. There were three traditional approaches for providing basic skills: (a) individual employees were either advanced or reimbursed for courses that could somehow enhance job performance; (b) the company sponsored reading or broader basic skills (usually GED) programs, often at the employee's request; and (c) programs were offered on an individual basis to employees to help them acquire the skills to function in a current job, or to advance to a new job for which they were otherwise qualified.

The climate in which traditional programs were established was generally one of prosperity and security for the company. Growth was rapid and product markets were secure. Either the union acted as employee advocate, or, in non-union companies, both the employer and the employee regarded the company as a caretaker of its workers. "A lot of [the] . . . influence . . . carries over to the employees' attitude that 'the company will take care of us,' that 'there will always be employment,' " a training manager commented. "Because of the changing technology, we found that can't always be true. . . . They need to upgrade their skills; they've been told that over and over the last three, four, five years."

In almost all cases "new" literacy programs (or a qualitatively different emphasis in basic skills training) were added after 1980. The new programs were intended to upgrade basic skills more widely in lower job classifications in a given department, or division, or on a company-wide basis. By the late 1970's, most of the companies—in contrast to their years of security—were faced with challenges that included rapid technological change and heavy foreign competition. Some—in contrast to their years of growth—were in the process of downsizing. The new basic skills programs were in some cases initiated after companies attempted to introduce new technological processes and discovered that employees lacked prerequisite skills to learn them. The new programs are clearly instruments of strategic planning in achieving company goals; collaboration is replacing adversarial relationships between management and union and paternal relationships between employers and employees.

FEATURES OF ADULT LITERACY PROGRAMS

TABLE 1

COMPANIES	Name of Program/Initiative Year Established/ Changed	Skill Requirements	Participation	Structure: ° Originator • Operator	Instructional Staff: ° Affiliation • Qualifications	Evaluation
ONAN	1982 Manufacturing Education Program (MEP)	Math, Algebra, Geom, Trig, Stats, Computer Lit, Reading, Writing	Initially, manufacturing employees, Electrical Products Division; later, all employees	° Management • Collaboration with consortium of school districts	° Public school consortium • State certification (not necessarily in subject area)	Student informal feedback
PHILADELPHIA HOSPITAL HEALTH CARE DISTRICT 1199C	° 1974 District 1199C Fund	ABE/GED Reading, Writing, Math, Computer Lit Training/Upgrading	Hospital/health care union members; financially disadvantaged Philadelphia residents	° Union • Collaboration - union - hospitals health care orgaization, city schools, community colleges	° Training fund • ABE/GED—licensed by state; pre-allied health—certified experience in adult education	Instructor testing, GED exams, employer feedback, union member participation
PLANTERS	°° 1978 Planters Employee Training (PET)	Reading, Writing, Math, Communication	Hourly-wage employees	° Management, union • Collaboration with city schools, state department of education	° City schools • State certification; experience with adults	Teacher and supervisor feedback
POLAROID	1970 Fundamental Skills Program 1984 Technology Readiness Program	Science (Physics, Chem) Algebra, Geom, Trig, Stats, Computer Lit, Speaking, Listening, Writing, Problem Solving	All employees	° Management • Company	° Company (hired as consultants) • No certification required; grounding in adult learning theory	Instructor's organized feedback; supervisor's informal feedback; employee's formal feedback
R. J. REYNOLDS	1983 New Generation Training	Reading	Hourly-wage employees	° Technical college • Collaboration with Technical college	° Technical college • Laubach Training	Adult basic learning Pre- and Posttests
ROCKWELL	1978 Rocky Mountain Energy and Environmental Technology Center 1983 Technical Education Center (TEC)	General Math, Algebra, General Science, Chem, Physics	All employees	° Federal, state, community-based education, industry consortium • Collaboration with community college	° Company • State certification in GED instruction	Improved union-management relations; semi-annual participation/ nonparticipant comparisons
TEXAS	1983 Basic Skills for Test Operators Program	Math, Communication (oral, written) Basic Physics (in electronics)	Circuit board assemblers, data systems group	° Management • Collaboration with community college	° Community college • State certification in GED instruction	Supervisor and employee Informal feedback; participant/nonparticipant comparisons

° Hospital's active role in detecting basic skill deficiencies is post-1980

°° The program fits the traditional pre-1980s pattern. These workers were not immediately affected by automated processes installed in a new plant being built by the company

Skills Requirements

The production system in which most of the hourly-wage workers were hired was designed originally to accommodate large numbers of entry-level workers with no or very low basic skills. The system was segmented. In the assembly jobs, employees' functions were limited and specific with a high degree of dependence on others. And although these jobs are changing with automation, a great number still exist. "We don't have to be able to do much figuring other than how many parts we might be short," a production supervisor explained. "Tolerances and gauge readings—most of that, if there was a problem with a part not being to specs, if it didn't fit up right, the assembler would notice it and call an inspector who would do the measuring and the checking on the unit—so he would be involved in the math more than the assembler would have to."

With the advent of automatic equipment and computer integrated work systems, workers in formerly low-skilled jobs are required to be much more involved in problem solving and decision making. This calls for higher basic skills requirements. Quality control processes, once performed by a separate unit or department, are now being performed on the production line. This calls for greater math skills. A training manager described the evolution in one job:

> Materials handlers are the guys that pick up boxes and move them from here over there. Twenty-five years ago . . . you hired people with muscles. . . . All you needed to do was lift . . . and be honest. Easy to hire. Now those guys—same guys, same job grade, same badges, muscles are a little weaker—sit in chairs and run computers that monitor automated warehouses. And they keep real-time inventories; they do real-time quality control. . . . And they've got a much more important role in the management of the operation intellectually than they ever did. . . . And that's what's happening all across jobs. Grunt jobs are turning into head jobs.

Although most of these companies still do not list formal requirements for entry-level jobs, they commonly reported using high school completion as an indication of an applicant's ability to function and acquire new skills. "Of course, earlier it may not have required that," a training manager stated, "but because of where we're going to in expectations of an assembler, a high school diploma or equivalent is almost mandatory." Most companies, however, had frozen hiring in the lowest entry-level jobs as they sought to reduce the ratio of them to more technical jobs. This situation is illustrated by the following training manager's comments: "I would say [the ratio of assemblers to technicians is] at least about three to one--about three times as many assemblers. But, with the new technology we're working towards, it would be about a fifty-fifty split. . . . [We] are moving toward advanced manufacturing."

The specific skills included in the definition of *basic* varied from company to company according to what was regarded as necessary to perform fundamental tasks. "I imagine that you find it interesting that we consider physics and chemistry a basic course in our plant," one training manager commented. "It's basic to our plant. . . . We just assume reading is there." Reading-related problems, however, are at the root of many other basic skill deficiencies. The problem was emphasized by one instructor who said, "I tell my class all the time that it's reading—the understanding of word problems [that's causing the trouble]."

Participation

As it was previously noted, earlier basic skills programs offered by corporations were regarded primarily as employee benefits. The new programs, as instruments of strategic planning for technological advancement, have engaged in a great deal more active recruitment for employee

participation through the use of internal brochures, newsletters, and other announcements. One of the most effective recruitment tools, and one that is heavily relied upon by the new programs, is the testimony of employees who have enrolled in and benefitted from classes through the program. Although participation is voluntary, many employees believe that successful completion of classes might be a major factor not only in considerations for promotion, but also in job retention during company downsizing.

For the most part, employees recruited for the literacy programs are middle-aged and have long histories of employment with their respective companies. They are stuck in jobs where the levels may stay the same, but competencies required will be rising. Aside from strictly humanitarian reasons, there are at least two others for wanting to retain these employees: (1) Companies recognize they have years of valuable experience, which are difficult to replace. One training manager points out that at least "sixty percent of what a person's doing in a new job area is usually stuff that he already knows how to do, and anywhere from 5 to 40 percent is stuff that he can learn over a period of time." (2) A much smaller entry-level pool will be available. The same manager observed, "I think . . . inevitably . . . any company that wants to stay in the labor market through the end of the century is going to have to retrain its workers because there aren't that many people coming in behind them."

The group that needs supplemental help in literacy skills is much larger than is commonly recognized. The problem is widespread among production workers. As one training manager indicated,

> This is a whole group of people who in the past thirty years have made it into the working middle class with only marginal cognitive skills. Their inferencing is weak, their generalization is weak. Those are reading skills the new jobs call [for]. You have to be able to read data, synthesize it, and predict trends. . . . The general education course in the 1950s . . . did not give [them] an adequate base for the kind of work that is done in the work place today.

The group that needs supplemental help includes office and supervisory staff as well. In some cases, enrollment quotas were increased after the programs were in operation in order to include these personnel. "Often exempt people have reading problems. . . . Lots of exempt people will come to us [in privacy] to work on their GEDs."

Program Structures

Within the corporate structure, basic literacy programs are usually the responsibility of the human resource development unit in personnel. Added to the chart of human resource development responsibilities—management development and technical development—basic literacy skills becomes a third leg.

Two staff arrangements are reflected in programs. In the first arrangement, a basic literacy skills program is an added responsibility for the training staff in charge of management; in the second, technical skill development is seen as sufficiently important to warrant hiring a separate person for that responsibility.

Industry-based literacy programs have been initiated by a variety of sources—by management, by a union, by a union-management partnership, and by external sources (a school and a consortium of groups). Programs were not embraced by all internal groups at the company site after their initiation. In one case the union viewed the start of the program as an imposition by management of a

nonnegotiated requirement on employees. In other cases some supervisors were lukewarm toward the programs—they saw the need for increased *technical skills* among the people in their unit, but they did not see *basic skills* as a factor in the acquisition of technical skills. One training manager related:

> Just within the past six months . . . has [the supervisor in one of our divisions] really figured out that the basic skills are the avenue to get into the technical skills. . . . We're now working in the maintenance organization and we're facing the same thing. Our maintenance people have to be up on trouble-shooting . . . and we're saying, "Right, but there are some basic math skills that are prerequisites for that." [The response from this supervisor is,] "We've got that [kind of] skill. We don't need any more. We don't have time to worry about that; we've got to take the technical courses." So, now we're going back and starting in the same place with the maintenance people.

Once the programs were initiated, however, the improved performance of employees tended to break down opposition. Internal program marketing improved as trainers involved units in supplying feedback on improved employee performance. Units that had opposed the program soon came to see it as necessary for technological advancement and identified with their own interests. Moreover, the unions considered that programs provided increased employee security.

Programs represented were solely company operated, or they were collaborative efforts between the company and (1) an adult basic education division or community education division of a secondary school system or (2) a community or technical college of a postsecondary system. In some cases, however, companies went through a trial-and-error process in developing a collaborative relationship with an educational institution. Unsuccessful cases generally involved the educational institution's inability to adapt to or accommodate industry's response time or flexibility requirements.

Instruction

There were three instructional arrangements for offering literacy programs: (1) on-site by company personnel, (2) on-site by an educational collaborator, and (3) off-site by an educational collaborator. On-site classes were offered in classrooms where available. Otherwise, space set aside in or adjacent to lunchrooms was used. Classes were most often offered in two-hour blocks immediately preceding or following a shift to allow participation by employees from both shifts.

Employees' previous experiences with school influenced their willingness to participate. As one training manager said, "School rooms are an inhibitor. . . . My clients, who are the employees here, have not as a whole had a very positive experience in the school room and shy away from it. And I would be reluctant to place them back in the schools. An advantage is that my program's in the factory."

There was a wide range of instructor qualifications in the various programs. Programs either required no teacher certification for noncollaborative programs, or regular or special teacher certification for collaborative programs. Regardless of certification requirements, however, there was a common emphasis on several features:

- that instructors be subject matter experts
- that instruction be client-centered, and adult-to-adult rather than authority-to-subordinate in relationships

- that instruction be flexible with a deemphasis on testing and grades
- that instructors be sensitive to employer needs in the design of curriculum

Evaluation

In one case, employees enrolled in basic education classes were given pre- and posttests to measure their gain in reading and math. Examinations were also given for GED classes. Companies either made comparisons or planned to make comparisons between participants and non-participants on progress on the job.

Most evaluation methods were informal. They included (1) verbal or written feedback by students on satisfaction with classes, relevance of classes to jobs, and improved job satisfaction; (2) increased demand for classes; and (3) informal feedback from supervisors on improved job performance. The last method was the most universally used and was regarded to be the most relevant.

As one instructor said, "I know that my student has hit a competency level when I can talk to the supervisor after two to three weeks and he can say, 'You know, he really does know where those buttons are now. When I tell him to shut it off, he knows where the stop buttons are.'" Sometimes employees had enrolled in the basic skills class because they had been promoted and needed to acquire additional skills for the new position.

Current and Future Status of Literacy Programs

Figure 1 offers a perspective on patterns of organizational development in American industry. It serves as a framework for analyzing current and future literacy needs affecting industry-based adult literacy programs.

The first stage, labeled **traditional/mechanistic,** characterizes the typical organizational model that grew out of the industrial revolution, and upon which industry in the United States—and industrialized nations in general—was based. The organizational type was characterized by—

- a hierarchical structure or pyramid form with strong authority on top and strict authority-subordinate relationships from top to bottom;
- limited and narrowly defined functions among the work force, providing workers with a limited perspective of the product; and
- highly mechanized and routinized work at the lower levels with no or low basic educational skill requirements.

This model—spurred by accelerated technological development in the United States and abroad, the challenge of foreign competitors (particularly Japan) in markets formerly dominated by American industry, and changing organizational philosophies—is undergoing rapid transition.

The pattern labeled **flexible/organic** is the one to which many organizations are moving in the more competitive environment; it is structured to facilitate the more rapid adaptability to change.

- The managerial function becomes characterized by more of a team approach with collegial relationships replacing strict authority-subordinate relationships to maximize input into the decision-making process.

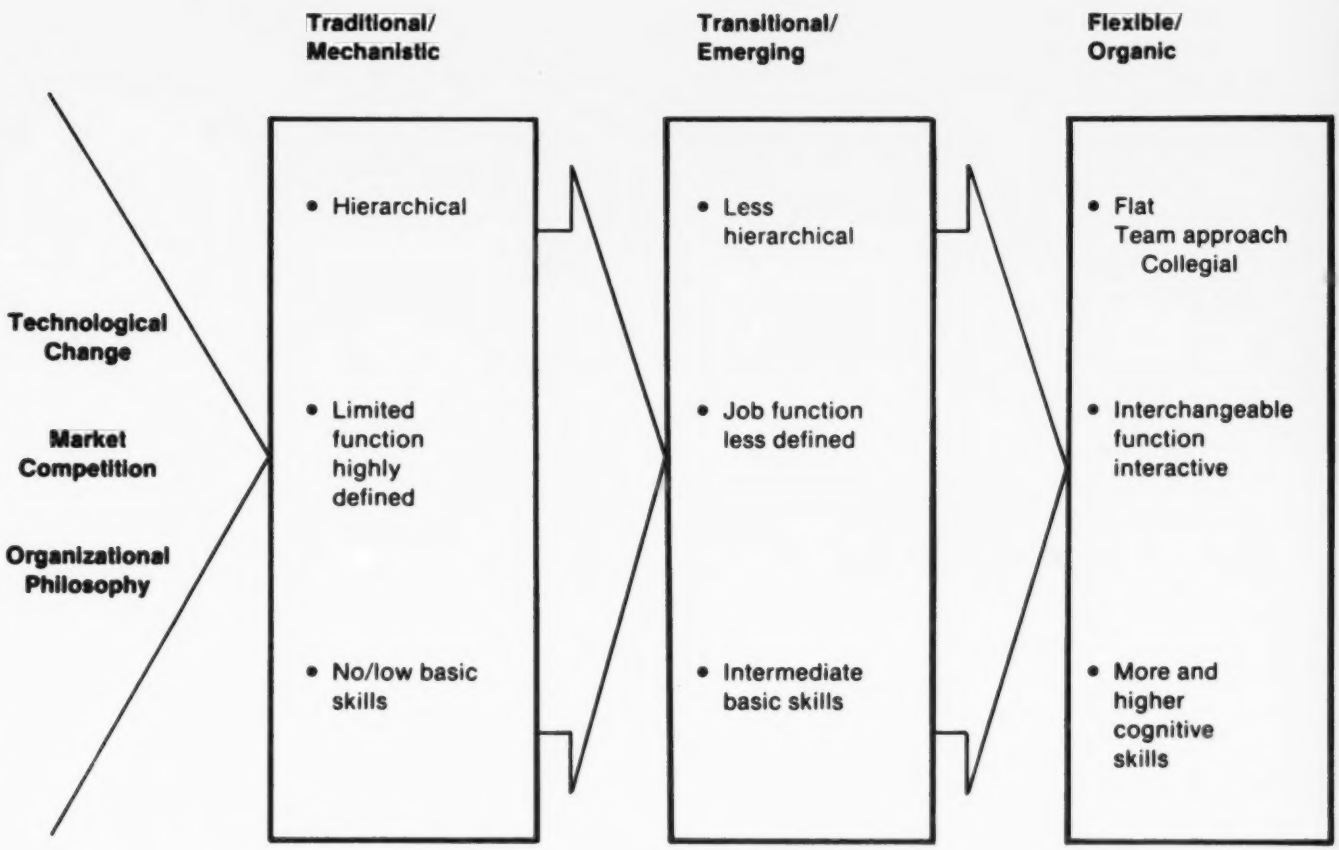

Figure 1. Organizational settings of industry-based literacy programs

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- Limited functions are recognized as inefficient; workers are expected to have a more holistic perspective of the product, the capability to perform a broader range of functions, and an ability to interchange tasks as required.
- Higher cognitive skills, including a capacity for decision making and continual learning, are required.

The current setting for most industry-based literacy programs is in **transitional/emerging** organizations, those that are somewhere enroute from the first to the third pattern of organizational development. In these organizations—

- management is moving toward less hierarchical relationships,
- job functions are becoming enlarged and less narrowly defined, and
- basic education skills are being upgraded to accommodate technological change.

This trend is expected to continue. This means literacy programs will become more prevalent among American industries with more and better training for in-plant employees. The predicted shortage of persons entering the work force in their early twenties will accelerate the need to train employees.

Summary of Findings

Investigation

The seven case studies reveal a number of general patterns in the establishment and operation of industry-based literacy programs. Following is a summary of major features:

- Industry-based basic literacy approaches can be divided into two groups: (1) pre-1980, viewed primarily as traditional benefits for the employee; and (2) post-1980, viewed primarily as instruments for achieving the company's advanced technology goals.
- Traditional programs were generally initiated in an era of company prosperity and security; new literacy skills programs were initiated during an era of foreign competition and rapid technological change.
- In some cases, new basic skills programs were initiated after it was discovered that employees lacked the basic skills with which to acquire more technical skills.
- The production system that most low-skilled workers entered was highly segmented and routinized, designed to accommodate large numbers of employees who had no or low basic skills.
- Advanced technology and worker-centered control processes are increasing the ratio of high- to low-skilled jobs available.
- High school diplomas or their equivalents are rapidly becoming the new standard entry-level requirement for industry.
- Reading and math were the two basic skills taught most often in the industry-based literacy programs.
- Employee participation in literacy programs was voluntary, but persons in need of training were less likely to be considered for promotion and more likely to be laid off during employee reduction.

- In nearly every literacy program, enrollment increased after the initial cycle when employees saw the benefits; in some cases, clerical workers and supervisors enrolled.
- Industry-based basic skills programs are adding a third responsibility to the more traditional human resource development responsibilities, (those of management training and technical training).
- Initial union resistance or supervisor indifference gave way to literacy program support after the benefits in improved worker performance became apparent.
- Literacy programs were solely company or union operated or they were collaborative efforts between the company or union and public secondary schools, community colleges, or technical schools.
- Literacy instructors were provided from within the company or recruited from outside, depending on skill training needs, staff capabilities, and flexibility of area educational institutions.
- Program evaluation tended to be informal and based on feedback from instructor, employee, and supervisor.
- Most industry-based literacy training occurs on the company site, partly for employee convenience, and partly because many employees find schoolroom environments inhibiting.

Recommendations

As more and more companies adopt state-of-the-art technologies, job tasks are becoming increasingly sophisticated and job functions are less narrowly defined, requiring better basic skills of workers. As a result, the incidence of industry-based literacy programs is likely to increase. Plant managers will have no choice but to upgrade the basic and technical skills of their work force.

Small companies will need to enlist the help of outside educational agencies to provide these training services. Already, community colleges and technical institutes provide many of the basic skills courses and customized training courses needed by these companies. Company executives, training department managers and instructors, and the public education community as a whole will need to learn more about the factors that make industry-based literacy programs successful. The remainder of this report offers recommendations to help training planners and instructors meet these expanding needs.

1. **The definition of literacy for the workplace should be expanded to include science and reasoning as pretechnical skills necessary for workers in high-tech industries.**

Observations from the industry-based programs show increasing need for production workers to have fundamental scientific knowledge as a prerequisite to the technical skills they must use with advanced technological process. Assembly-line workers in all industries will need particularly good reasoning skills to solve problems quickly and effectively.

2. **Analyses of tasks to be performed on the job should be used as a basis for developing higher-order literacy skills among employees.**

Occupationally relevant literacy skills are necessary for employees to become proficient in their jobs. Task analysis of occupations will help trainers develop the literacy instruction needed for occupational proficiency. Of course, broadly based higher-order literacy skills, such as reasoning

and problem solving, are more universally applicable than most occupational skills, such as reading a blueprint. But using occupationally relevant material in teaching basic skills is likely to speed up the learning process and make the training more meaningful to the workers. See Norton's DACUM Handbook (1985) for a practical guide to innovative occupational analysis.

3. **Companies should establish a secure atmosphere in which employees can assess and raise skill levels.**

The stigma of illiteracy stands as a barrier for many otherwise capable and valuable employees to raise their skill levels. Ingredients in a basic skills program should include (1) nonthreatening means for employees to assess skill deficiencies against requirements of current and new technological processes, and (2) internal marketing and peer support to encourage wide participation in basic skills classes.

4. **Whenever possible, companies should try to upgrade the skills of existing workers for new tasks rather than hire new workers and lay off existing workers.**

Generally, companies find it more cost-effective to upgrade the skills of existing employees than to hire new people. Also, this practice provides for the continuing development of persons, improves employees' morale, and avoids the disruptive effects of layoffs and terminations.

5. **Training managers need to develop clearer ways of showing return on investment in basic skills programs in order to enhance internal marketing of programs.**

As a supplement to more anecdotal information, programs should develop instruments to document such cost-related results as safety performance and productivity by comparing program participants and nonparticipants.

6. **Collaboration should be maximized between industry and educational service providers whenever this provides high-quality instruction in a cost-effective manner.**

Most of the companies in this study offer literacy programs in collaboration with educational agencies. This practice provides a beneficial mix of educational expertise and industrial know-how. Successful linkages require that the educational institution understand company philosophy and that both parties adopt a flexible working relationship.

7. **Programs should be developed to update the skills of literacy teachers who are to be instructors in business and industry.**

Literacy instructors, both at industry sites and in educational institutions, need to be knowledgeable and proficient in the latest teaching techniques in adult education. Instructors, particularly those from educational agencies, must be sensitive to the special needs and pace of adult learners. They must also be sensitive to the needs of the employer and flexible enough to make the necessary curriculum adjustments to reflect those sensitivities.

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